Predicting the Viscosity of Petroleum Fluids- What Is the Next Step?

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The compositional complexity of petroleum fluids introduces severe constraints on the type of methods that can be used to predict their thermophysical properties. The plethora of molecular species necessitates a grouping procedure that results in a simplified compositional specification. There exist a large number of grouping methodologies, driven by either a particular application or specific need. More often than not a particular grouping will lack general suitability for all thermophysical properties. Furthermore, different parts of the petroleum industry (downstream/upstream) require different compositional fluid specifications resulting in frequent lumping and delumping procedures which imposes further constraints on predictive methodologies. The situation is especially acute when trying to predict the fluid viscosity. Petroleum engineers rely primarily on simple, empirical methods (correlations) or schemes that make use of universal behaviour. Both sets of methods are frequently matched to lab data to improve accuracy. In the last few decades we have seen the advent of a number of promising methodologies for predicting the viscosity of compositionally, well-defined fluid mixtures. These methods are accurate, reliable, self-consistent and have in most cases strong theoretical foundations. The current talk will explore how we can use the current state-of-the-art methods to predict the viscosity of reservoir fluids. It will provide an overview of petroleum industry practices and modern viscosity prediction methods. It will highlight the main challenges and indicate the most promising approach in overcoming them. The emphasis will be on what is the most appropriate grouping, how important is the sensitivity of viscosity to temperature and density and what role do particular model parameters play in determining what are the most appropriate mixing rules.